SOILS INVESTIGATION

NIU VALLEY - HALEOLA STREET

NIU VALLEY HIGHLANDS UNIT II

TMK: 3-7-03: 72

for

BUDGET REALTY

W.O. 156

July 13, 1972

ERNEST K. HIRATA & ASSOCIATES, INC.

Soils and Foundation Engineering

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
1157 South King Street • Honolulu, Hawaii 96814 • Phone 531-5733

July 13, 1972
W.O. 156

Budget Realty
1234 Kaumualii Street
Honolulu, Hawaii 96817

Attention: Mr. Richard Mew

Subject: Soils Investigation
Niu Valley - Haleola Street
Niu Valley Highlands Unit II
TMK: 3-7-03: 72

Gentlemen:

The following report titled "Soils Investigation, Niu Valley - Haleola Street, Niu Valley Highlands Unit II, TMK: 3-7-03: 72," dated July 13, 1972, our work order 156 is enclosed.

This investigation was authorized to determine the subsurface soil conditions at the site and to determine if any unusual or adverse conditions might exist which would affect the proposed development.

This investigation was planned in cooperation with Mr. Yasuo Arakaki, Consulting Civil Engineer.

We found that the surface soils consisted of a gray to brown gravelly clay. This material can be considered as alluvium deposits transmitted by wind and rain towards the valley floor. The gravelly or rocky clay was found to be stiff and tight. The surface soils are considered highly expansive when water is introduced.

The site is feasible for the proposed development provided the recommendations in this report are followed.

We appreciate the opportunity to be of service. Should you have any questions, please feel free to call on us.

Very truly yours,

Ernest K. Hirata & Associates, Inc.

Ernest K. Hirata

Ernest K. Hirata

EKH: ph

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SOILS INVESTIGATION

NIU VALLEY - HALEOLA STREET

NIU VALLEY HIGHLANDS UNIT II

TMK: 3-7-03: 72

INTRODUCTION

This report presents the results of our soils investigation conducted on the subject property. The scope of this investigation was planned in collaboration with Mr. Yasuo Arakaki, Consulting Civil Engineer. This investigation was authorized to determine the subsurface soil conditions at the site and to provide preliminary recommendations for the residential development.

SITE DESCRIPTION

The proposed site is located in the valley between Hawaiiloa Ridge and Kulepiamoa Ridge in the Niu Valley area.

The site extends approximately 1500 feet from the end of Haleola Street. A former river bed bisects the proposed subdivision in half along the length of the subdivision.

A graded road extends along the western half of this site near where the proposed extension of Anolani Street is to be built.

Large boulders were observed over the entire site, and especially in the area of the proposed channel. The entire area has heavy growth of halekoa trees and California grass.

Groundwater was not encountered in any of the exploratory borings nor was surface water observed anywhere on the site.

PROPOSED GRADING

The proposed development will include 61 residential lots.

Based on the preliminary grading plan, grading for the western half of the site will be limited primarily to the extension of Anolani Street. The maximum height of cut slope is expected to be approximately 30 feet in the rear of lots 56 through 58.

On the eastern half of the site, fill will be placed extensively on the downhill side of the extension of Haleola Street. Approximately 10 feet of fill will be placed in the lots adjacent to the proposed channel.

Grading will also be necessary for the proposed 0.3 M.G. Reservoir.

FIELD EXPLORATION

Field exploration was performed on June 27 and 28, 1972 using a truck mounted rotary auger drill rig.

A total of 9 exploratory borings were drilled ranging in depth from 4.0 to 18.75 feet. The soils were continuously logged by our field engineer and classified by visual examination in accordance with the Unified Soil Classification System.

Undisturbed and bag samples were recovered from the borings for laboratory testing. Undisturbed samples were obtained by driving a thin walled steel sampler with a 140 pound hammer from a height of 30 inches. The required blow count for each 6 inches of penetration is shown on the enclosed "Boring Logs," Plates A1 through A9.

SOIL CONDITIONS

The surface soils consisted of a gray to brown gravelly clay. This material can be considered as alluvium deposits transmitted by wind and rain towards the valley floor. All borings encountered numerous cobbles and boulders in the alluvium material.

The gravelly or rocky clay was found to be stiff and tight. Laboratory tests indicate that the clay is highly expansive when water is introduced.

All of the borings encountered cobbles and boulders, and difficulty was encountered in recovering samples.

LABORATORY TESTING

Laboratory testing was performed on the undisturbed and bag samples to determine their strength characteristics and engineering properties. Laboratory tests included Atterburg Limits, moisture density relationships, consolidation, compaction, swells and remolded swells. Test results and testing procedures are described in the attached Appendix.

CONCLUSIONS AND RECOMMENDATIONS

A. Slope Stability

It is our opinion that the subject property can be safely developed utilizing a maximum slope gradient of $1\frac{1}{2}$:1 for cut slopes in the gravelly clay. A slope gradient of 2:1 may be used for fill slopes. For those cut slopes where hard basaltic rock is encountered, slope gradients of 1:1 may be used.

During grading, all loose boulders should be removed from areas above the proposed grading areas to prevent the possibility of damage to future homes.

To minimize the effects of erosion and weathering, all slopes should be planted as soon as practical upon completion of grading.

B. Groundwater

Groundwater was not encountered in any of the borings and the need for subdrains is not anticipated.

C. Bearing Capacity

Slab type foundations will not be feasible due to the expansiveness of the soil, and therefore post and beam type construction should be considered. An allowable bearing value of 2000 pounds per square foot may be used for footings having a minimum width of 12 inches and a

minimum embedment of 12 inches in both cut and fill. However for footings located on slopes, the embedment should be 24 inches.

D. Lateral Pressures

An equivalent fluid pressure of 50 pounds per cubic foot per foot of depth may be used in the design of retaining walls and channel walls.

E. Settlement of Fills

Data obtained from the exploratory borings indicate that the gravelly clays are in a stiff condition, and settlement from placement of fills is expected to be negligible.

F. Expansive Soils

The results of the loaded swell tests indicate that the surface gravelly clays are highly expansive. Special foundation design will be necessary to prevent damage to slabs on grade such as garage slabs.

The upper two feet under slab should be replaced with non expansive material. In addition slabs should be reinforced with 6x6 - #10x#10 welded wire mesh located in the center of the slab.

G. Grading

Rippability: The onsite soils encountered during our investigation indicate that excavations can be made with

conventional earth moving equipment. However areas above the proposed roads may consist of basaltic rock and blasting may be required. In addition, large boulders may be encountered which may require blasting.

Insitu Moisture Content: The insitu moisture of the soils encountered will require air drying in order to achieve proper compaction.

Our minimum Grading Specifications are attached and shall be considered a part of the recommendations except where specifically superceded in the text of this report.

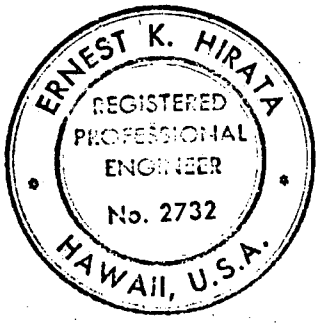
1. All heavy vegetation shall be stripped and wasted from the site.

2. Oversize material shall not be placed within 5 feet of finish pad grade nor placed within 10 feet of any slope face.

3. All fill shall be placed and compacted to at least 90% relative compaction using Modified AASHO 7-180 laboratory test.

H. Pavement Design

Pavement design recommendations will be submitted in an addendum report upon completion of grading.



Respectfully submitted,

Ernest K. Hirata & Associates, Inc.

Ernest K. Hirata

Ernest K. Hirata P.E. 2732

APPENDIX OF LABORATORY TESTING

Classification

The field classification is verified in the laboratory, also in accordance with the Unified Soil Classification System. Laboratory classification is determined by both visual examination and Atterburg Limit Tests according to ASTM D423 and D424. The final classification is shown on the Boring Logs.

Moisture-Density

The field moisture content and dry unit weight are determined for each of the undisturbed soil samples. The information is useful in providing a gross picture of the soil consistency between borings and any local variations. The dry unit weight is determined in pounds per cubic foot while the moisture content is determined as a percentage of the dry unit weight. These samples are obtained from a 3" O.D. split tube sampler.

Consolidation

Settlement predictions of the soil's behavior under load are made on the basis of the consolidation tests. Loads are applied in several increments in a geometric progression, and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen having an inside diameter of 2.40 inches and a height of 1 inch to permit addition and

release of pore fluid. Results of undisturbed and remolded samples are plotted on the Consolidation Test Report.

Compaction Tests

Compaction tests were performed on bag samples to determine the optimum moisture content at which each type of proposed fill material compacts to 100% density. The tests were performed according to the Modified AASHO T-180.

Swell Tests

Swell tests were performed to determine the expansiveness of the onsite surface soils. The tests were performed on undisturbed ring and remolded samples taking a one inch high specimen under different surcharge loads.

Shear Tests

Shear tests are performed in the Direct Shear Machine which is of the strain control type. The rate of deformation is approximately 0.03 inches per minute. Each sample is sheared under varying confining loads in order to determine the Coulomb shear strength parameters, cohesion and angle of internal friction. Eighty percent of the ultimate value is taken to determine the shear strength parameters.

ERNEST K. HIRATA & ASSOCIATES INC.

STANDARD GRADING SPECIFICATIONS

These specifications present the usual and minimum requirements for grading operations performed under the control of Ernest K. Hirata & Associates Inc.

No deviation from these specifications will be allowed, except where specifically superseded in the preliminary soils report, or in other written communication signed by the Soils Engineer.

I. GENERAL

A. The Soils Engineer is the Owner's or Builder's representative on the project. For the purpose of these specifications, supervision by the Soils Engineer includes that inspection performed by any person or persons employed by, and responsible to, the licensed Civil Engineer signing the soils report.

B. All clearing, site preparation or earthwork performed on the project shall be conducted by the Contractor under the supervision of the Soils Engineer.

C. It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Soils Engineer and to place, spread, mix, water and compact the fill in accordance with the specifications of the Soils Engineer. The Contractor shall also remove all material considered unsatisfactory by the Soils Engineer.

D. It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of compaction. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement and time of year.

E. A final report shall be issued by the Soils Engineer attesting to the Contractor's conformance with these specifications.

II. SITE PREPARATION

A. All vegetation and deleterious material such as rubbish shall be disposed of offsite. This removal must be concluded prior to placing fill.

B. Soil, alluvium or rock materials determined by the Soils Engineer as being unsuitable for placement in compacted fills shall be removed and wasted from the site. Any material incorporated as a part of a compacted fill must be approved by the Soils Engineer.

C. After the ground surface to receive fill has been cleared, it shall be scarified, disced or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks or other uneven features which may prevent uniform compaction.

The scarified ground surface shall then be brought to optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than twelve inches in depth, the excess shall be removed and placed in lifts restricted to six inches.

Prior to placing fill, the ground surface to receive fill shall be inspected, tested and approved by the Soils Engineer.

D. Any underground structures such as cesspools, cisterns, tunnels, septic tanks, wells, pipelines or others not located prior to grading are to be removed or treated in a manner prescribed by the Soils Engineer.

III. COMPACTED FILLS

A. Any material imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Soils Engineer. Roots, tree branches and other matter missed during clearing shall be removed from the fill as directed by the Soils Engineer.

B. Rock fragments less than six inches in diameter may be utilized in the fill, provided:

1. They are not placed in concentrated pockets.

2. There is a sufficient percentage of fine-grained material to surround the rocks.

3. The distribution of the rocks is supervised by the Soils Engineer.

C. Rocks greater than six inches in diameter shall be taken offsite, or placed in accordance with the recommendations of the Soils Engineer in areas designated as suitable for rock disposal.

D. Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fill.

E. Representative samples of materials to be utilized as compacted fill shall be analyzed in the laboratory by the Soils Engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Soils Engineer as soon as possible.

F. Material used in the compacting process shall be evenly spread, watered, processed and compacted in thin lifts not to exceed six inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Soils Engineer.

G. If the moisture content or relative density varies from that required by the Soils Engineer, the Contractor shall rework the fill until it is approved by the Soils Engineer.

H. Each layer shall be compacted to 90 percent of the maximum density in compliance with the testing method specified by the controlling governmental agency.

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or expansive soil conditions, the area to receive fill compacted to less than 90 percent shall either be delineated on the grading plan or appropriate reference made to the area in the soil report.

I. All fills shall be keyed and benched through all topsoil, colluvium, alluvium or creep material, into sound bedrock or firm material where the slope receiving fill exceeds a ratio of five horizontal to one vertical, in accordance with the recommendations of the Soils Engineer.

J. The key for side hill fills shall be a minimum of 15 feet within bedrock or firm materials, unless otherwise specified in the soils report.

K. Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Soils Engineer.

L. The Contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction.

If a method other than overbuilding and cutting back to the compacted core is to be employed, slope tests will be made by the Soils Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified of such conditions by written communication from the Soils Engineer in the form of a conference memorandum, to avoid any misunderstanding arising from oral communication.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no additional cost to the Owner or Soils Engineer.

M. All fill slopes should be planted or protected from erosion by methods specified in the soils report.

N. Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials; and the transition shall be stripped of all soil prior to placing fill.

IV. CUT SLOPES

A. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature are encountered during grading, these conditions shall be analyzed by the Soils Engineer; and recommendations shall be made to treat these problems.

B. Unless otherwise specified in the soils report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

C. Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Soils Engineer.

V. GRADING CONTROL

A. Inspection of the fill placement shall be provided by the Soils Engineer during the progress of grading.

B. In general, density tests shall be made at intervals not exceeding two feet of fill height of every 500 cubic yards of fill placed. This criteria will vary

depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verify that the required compaction is being achieved.

C. Density tests shall also be made on the surface material to receive fill as required by the Soils Engineer.

D. All cleanout, processed ground to receive fill, key excavations, subdrains and rock disposal must be inspected and approved by the Soils Engineer prior to placing any fill. It shall be the Contractor's responsibility to notify the Soils Engineer when such areas are ready for inspection.

VI. CONSTRUCTION CONSIDERATIONS

A. Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

B. Upon completion of grading and termination of inspections by the Soils Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Soils Engineer.

C. Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B1 DRIVING WT. 140 lb. DATE OF DRILLING 6/27/72

SURFACE ELEV. 112 + DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0									Gravelly CLAY (MH) - Gray, stiff, moist, with cobbles and boulders.
5	x		20/5"	92.3	20.8				
10	x		18/4"	No Recovery					
									End boring at 11.5 feet.
15									
20									
25									
30									

Plate A1

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B2 DRIVING WT. 140 lb. DATE OF DRILLING 6/27/72

SURFACE ELEV. 160+ DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0									Gravelly clay (MH) - Grayish brown, boulder from 1 foot.
5									End boring at 4 feet. Cannot penetrate.
10									
15									
20									
25									
30									

Plate A2

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BORING LOG

BORING NO. B3 DRIVING WT. 140 lb. DATE OF DRILLING 6/27/72

SURFACE ELEV. 170+ DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0	x		49	No Recovery					Gravelly CLAY (MH) - Gray, moist, stiff, with cobbles.
5	x		13/3"	83.1	45.1				
10	x		10/2"	No Recovery					
									End boring at 12 feet.
15									
20									
25									
30									

Plate A3

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B4 DRIVING WT. 140 lb. DATE OF DRILLING 6/27/72

SURFACE ELEV. 210 ± DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0									Gravelly CLAY (CL) - Brown, moist, stiff, numerous cobbles.
5	x		8 13/4"	85.8	35.1				
10	x		19	No Recovery					
									End boring at 10.5 feet.
15									
20									
25									
30									

Plate A4

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B5 DRIVING WT. 140 lb. DATE OF DRILLING 6/28/72

SURFACE ELEV. 99+ DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0									Gravelly CLAY (MH) - Gray, moist, stiff, numerous cobbles.
5	x		17	No Recovery					
10		x	10	111.2	10.3				
15									End boring at 13 feet.
20									
25									
30									

Plate A5

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B6 DRIVING WT. 140 lb. DATE OF DRILLING 6/28/72

SURFACE ELEV. 108+ DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0									Gravelly CLAY (MH) - Brown, moist, stiff.
5	x		20/2" No Recovery						
									End boring at 8 feet.
10									
15									
20									
25									
30									

Plate A6

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B7 DRIVING WT. 140 lb. DATE OF DRILLING 6/28/72

SURFACE ELEV. 132 ± DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0	x		8 21	92.6	27.5				Gravelly CLAY (MH) - Brown, moist, very stiff, numerous cobbles.
5	x		13/0"	No Recovery					
10									End boring at 8 feet.
15									
20									
25									
30									

Plate A7

ERNEST K. HIRATA & ASSOC.

BORING LOG

BORING NO. B8 DRIVING WT. 140 lb. DATE OF DRILLING 6/28/72

SURFACE ELEV. 130 ± DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0									Gravelly CLAY (MH) - Brown, moist, stiff, with numerous cobbles.
5	x		11 13	No Recovery					Grading to gray color from 7 feet.
10	x		13	87.9	30.7				
15	x		15/3"	No Recovery					
20									End boring at 18.75 feet.
25									
30									

Plate A8

ERNEST K. HIRATA & ASSOC.

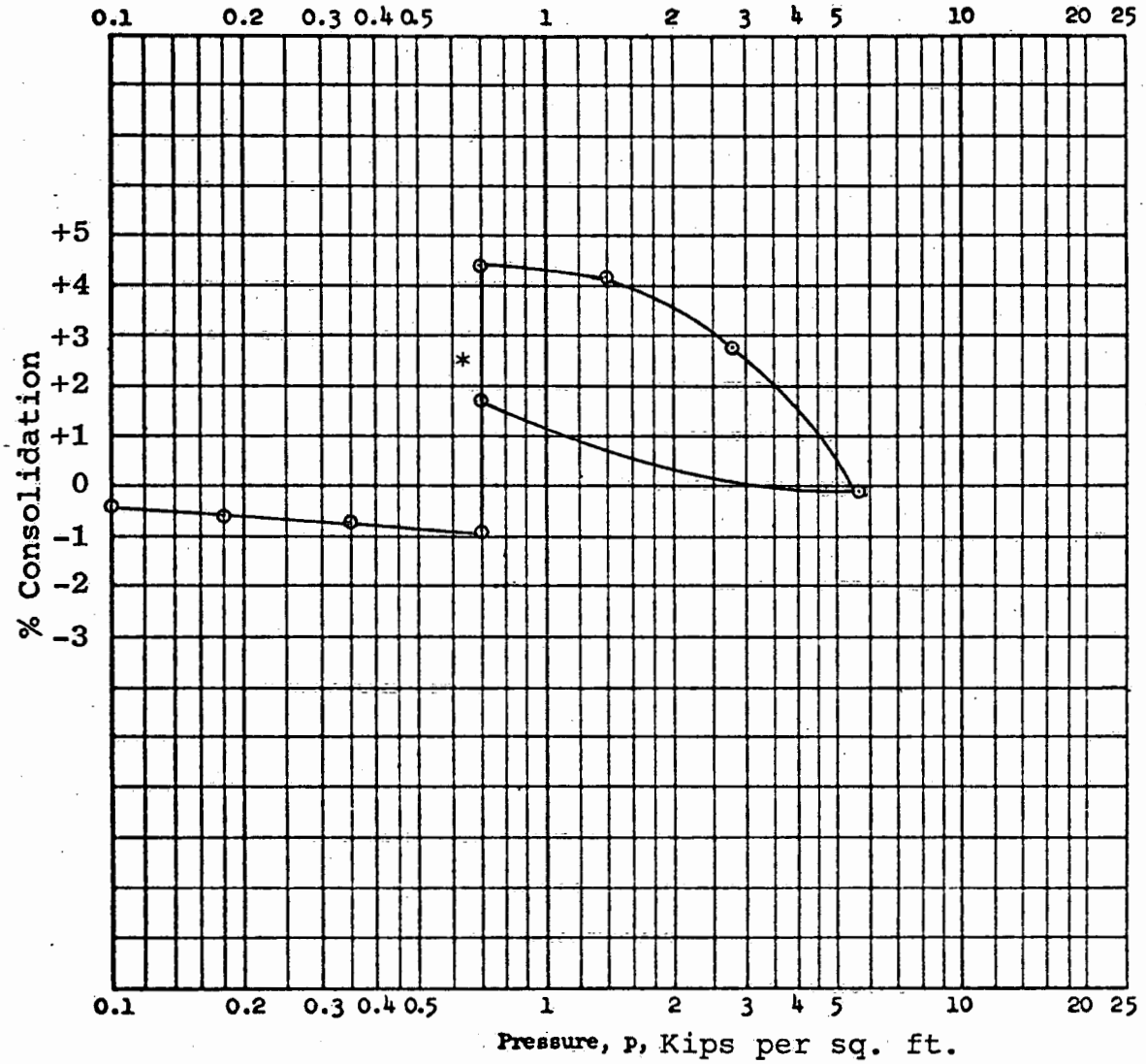
BORING LOG

BORING NO. B9 DRIVING WT. 140 lb. DATE OF DRILLING 6/28/72

SURFACE ELEV. 270 ± DROP 30 in. W.O. 156

DEPTH FEET	CORE	BAG	PENE. RESIST. BLOWS/FOOT	DRY DENSITY PCF	MOISTURE CONTENT %	RELATIVE COMPACTION %	DIRECT SHEAR STRENGTH PARAMETERS ø	DIRECT SHEAR STRENGTH PARAMETERS C	CLASSIFICATION (% Sand, % Silt, % Clay)
0									Gravelly CLAY (MH) - Grayish brown, moist, stiff, numerous cobbles.
5	x		14 26 23/5"	84.1	29.8				
10	x		11 11 16	86.5	35.1				
15	x		15/1" No Recovery						End boring at 15 feet.
20									
25									
30									

Plate A9

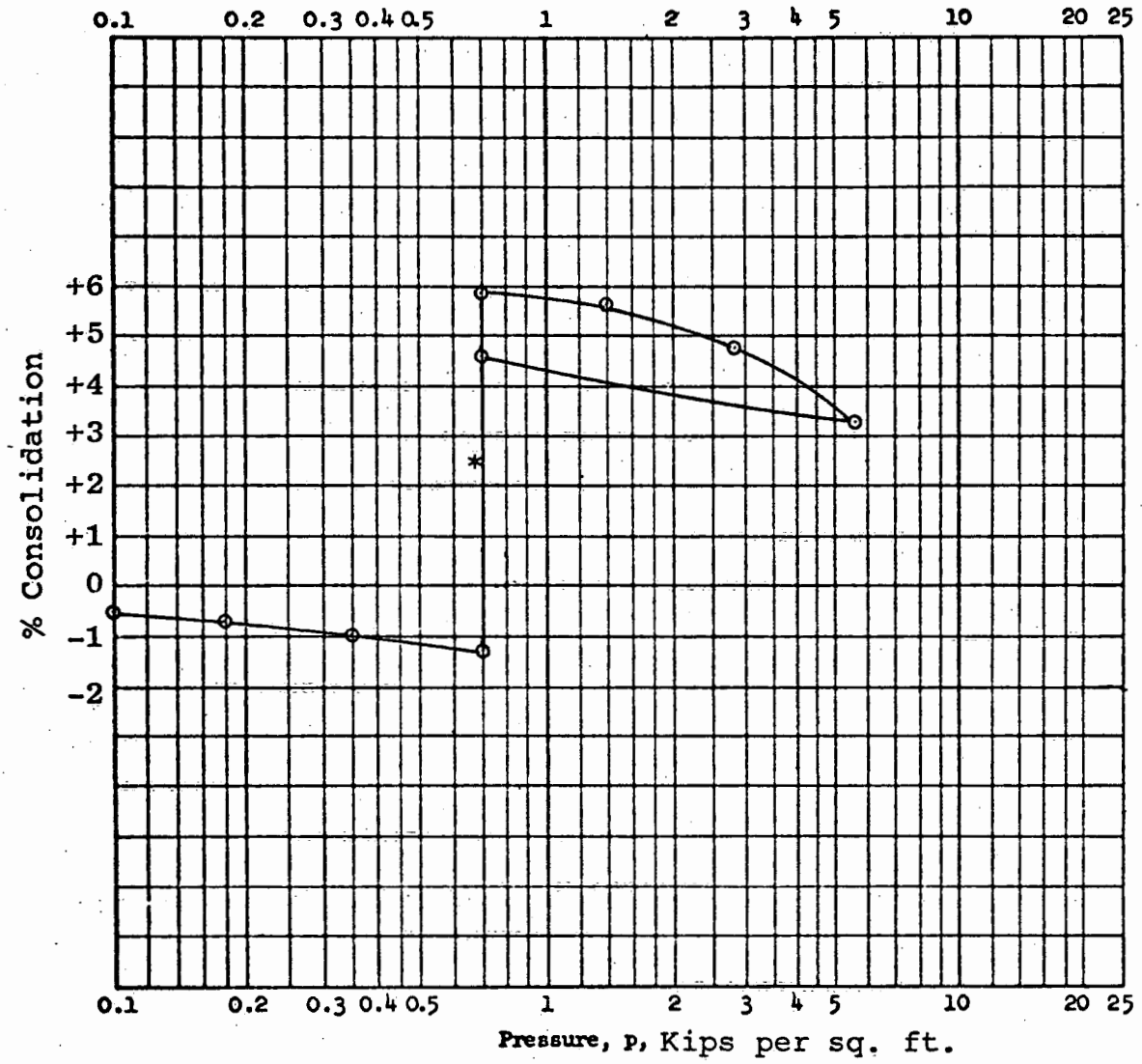


Type of Specimen: Undisturbed		Before Test		After Test	
Diam 2.40 in.	Ht 1.0 in.	Water Content, w_o	45.1 %	w_f	%
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o		e_f	
Preconsol. Pressure, p_c T/sq ft		Saturation, S_o	%	S_f	%
Compression Index, C_c		Dry Density, γ_d	83.1 lb/ft^3		
Classification MH		k_{20} at e_o =	x 10$^-$ cm/sec		
LL	G_s	Project Niu Valley Highlands Unit II			
PL	D_{10}	Budget Realty			
Remarks *Water added at 700 PSF		Area W.O. 156			
		Boring No. B3	Sample No.		
		Depth 7' El	Date 6-29-72		
		CONSOLIDATION TEST REPORT			

ENG FORM 2090
1 MAY 63

0 3424

Plate B1

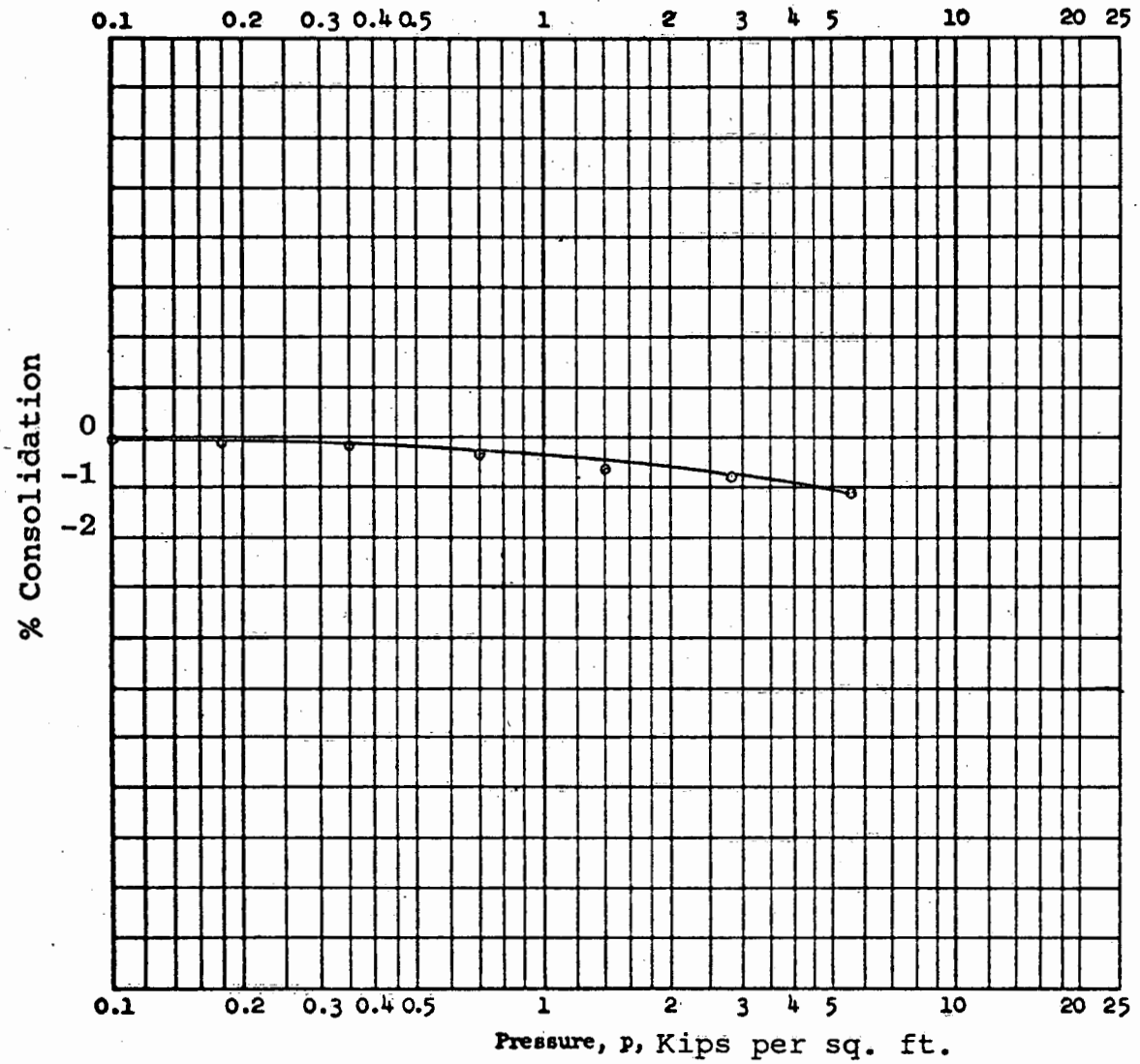


Type of Specimen	Undisturbed	Before Test		After Test	
Diam 2.40 in.	Ht 1.0 in.	Water Content, w_o	27.5 %	w_f	38.5 %
Overburden Pressure, p_o T/sq ft		Void Ratio, e_o		e_f	
Preconsol. Pressure, p_c T/sq ft		Saturation, S_o	%	S_f	%
Compression Index, C_c		Dry Density, γ_d	92.6 lb/ft^3		
Classification MH		k_{20} at e_o =	x 10$^-$ cm/sec		
LL	G_s	Project Niu Valley Highlands Unit II			
PL	D_{10}	Budget Realty			
Remarks *Water added at 700 PSF		Area W.O. 156			
		Boring No. B7		Sample No.	
		Depth 2' El		Date 7-3-72	
		CONSOLIDATION TEST REPORT			

ENG FORM 2090
1 MAY 63

0 3424

Plate B2



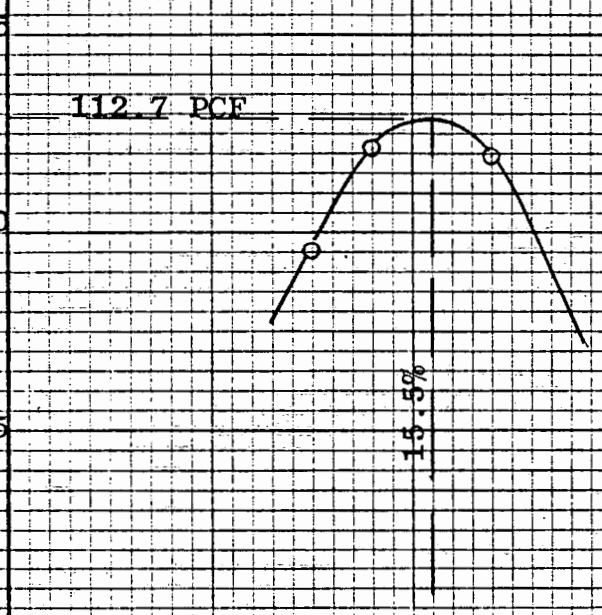
Type of Specimen Remolded		Before Test		After Test	
Diam 2.40 in.	Ht 1.0 in.	Water Content, w_o	16.0 %	w_f	%
Overburden Pressure, p_o	T/sq ft	Void Ratio, e_o		e_f	
Preconsol. Pressure, p_c	T/sq ft	Saturation, S_o	%	S_f	%
Compression Index, C_c		Dry Density, γ_d	112.6 lb/ft^3		
Classification MH		k_{20} at e_o =	x 10$^-$ cm/sec		
LL	G_s	Project	Niu Valley Highlands Unit II		
PL	D_{10}		Budget Realty		
Remarks No water added		Area	W.O. 156		
		Boring No. B3		Sample No.	
		Depth El Surface		Date 7-3-72	
		CONSOLIDATION TEST REPORT			

ENG FORM 2090
1 MAY 63

0 3424

Plate B3

MAXIMUM DENSITY CURVE



Boring: B3

Depth: Surface

Classification: MH W.O. 156

Gray gravelly clay

LL=59.9

PL=30.8

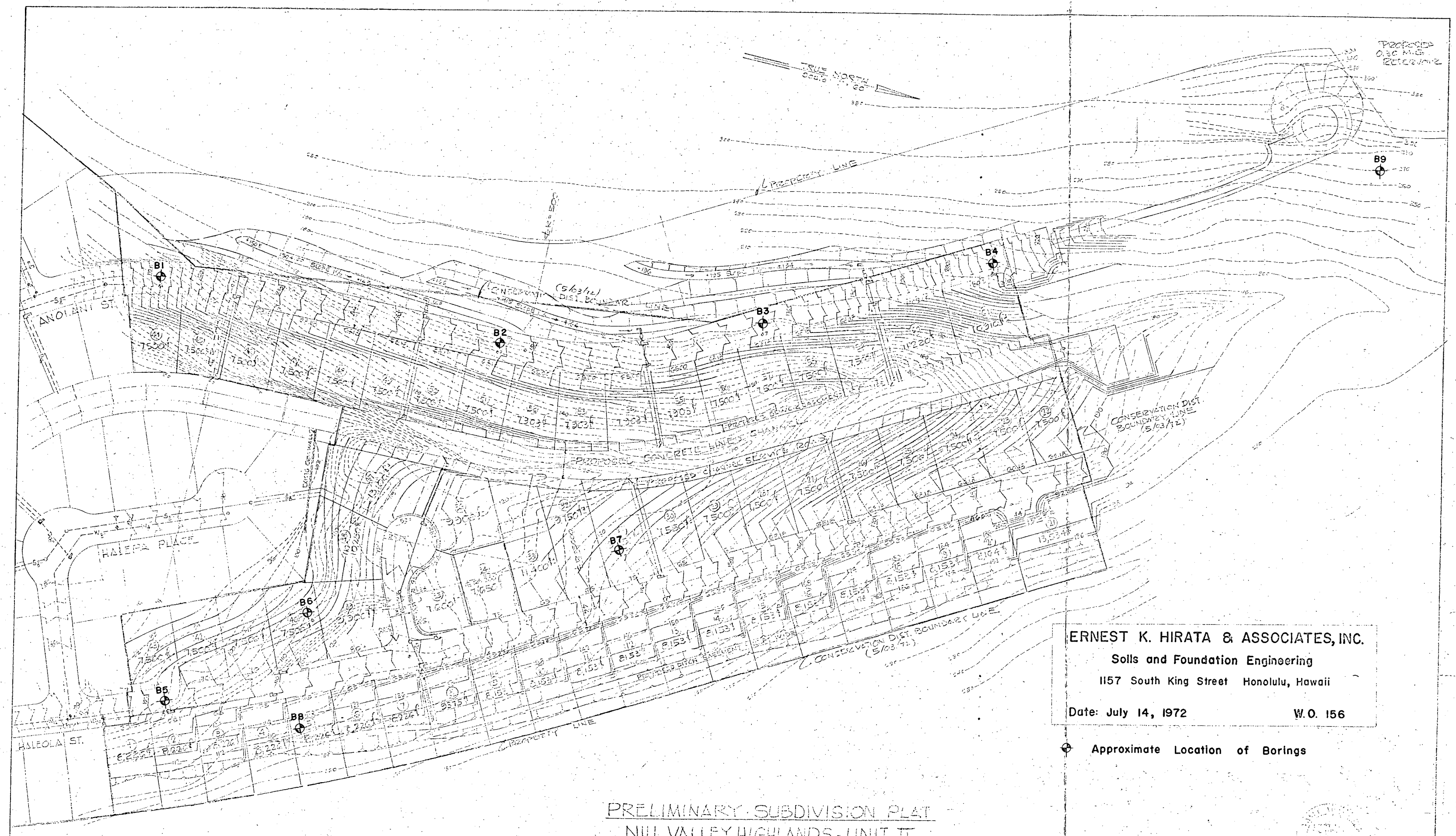
PI=29.1

LABORATORY TEST RESULTS

Project: Niu Valley Highlands Unit II **W.O.** 156

Boring or Test Pit No.	B3	B3	B7		
Depth (ft.)	Surface	7'	2'		
Atterburg Limit Tests					
Liquid Limit	59.9				
Plastic Limit	30.8				
Plastic Index	29.1				
Soil Classification	MH	MH	MH		
Expansion @70 PSF					
Natural					
Remolded	26.0				
Expansion @ 700 PSF					
Natural		5.3	7.1		
Remolded					
Unconfine Stress (PSF)					
Proctor					
Max. Dry Unit Wt. (PCF)	112.7				
Optimum Water (%)	15.5				
Wet Density In-Place (PCF)		120.6	118.1		
Moisture In-Place (%)		45.1	27.5		
Dry Unit Wt. In-Place (PCF)		83.1	92.6		
Remolded Shear Test	Ø=55 C=4.0 KSF				

Plate D



PRELIMINARY SUBDIVISION PLAT
NIU VALLEY HIGHLANDS - UNIT II
NIU, WAIKIKI, HONOLULU, HAWAII

OWNER : BUDGET REALTY LTD.
TAX MAP KEY : 3-7-03-72

RECEIVED MAY 5, 1972
DATE: MAR 26 1972

ERNEST K. HIRATA & ASSOCIATES, INC.
Soils and Foundation Engineering
1157 South King Street Honolulu, Hawaii

Date: July 14, 1972 W.O. 156

⊕ Approximate Location of Borings